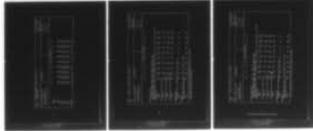


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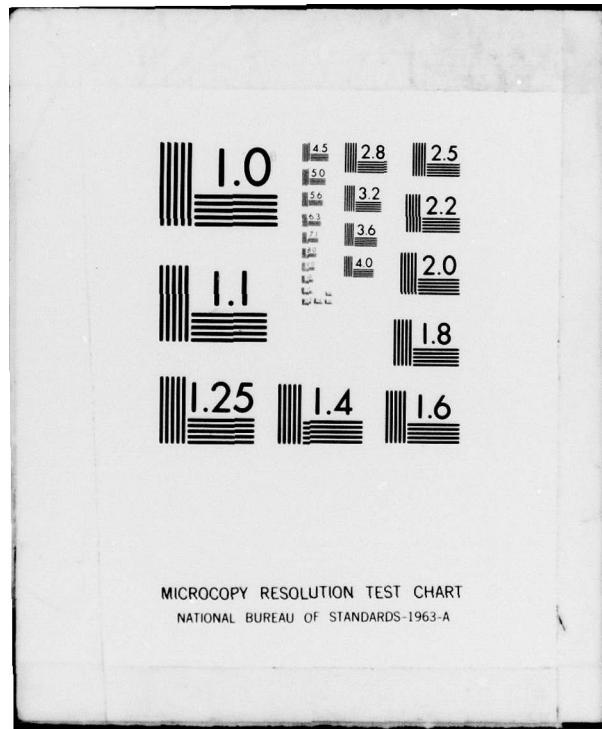
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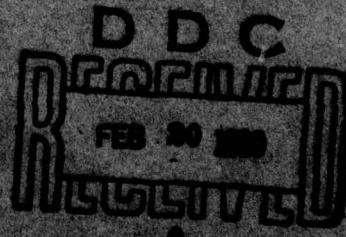
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Volume 143
F-105D In-Flight Crew Noise AD 80910

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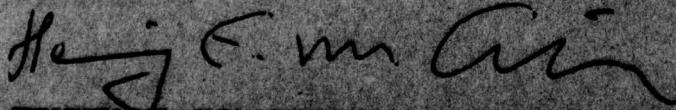
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FOR THE COMMANDER



HENNINGE. VON GIERKE
Director
Biodynamics and Bioengineering Division
Aerospace Medical Research Laboratory

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The F-105D is a USAF all-weather fighter-bomber. This report provides measured data defining the bioacoustic environments at the pilot's location inside this aircraft for 19 conditions. Data are reported for one location in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times		

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for total daily exposure of personnel with and without standard Air Force ear protectors. Refer to Volume 1 of this handbook, "USAF Bioenvironmental Noise Data Handbook, Volume 1: Organization, Content and Application," AMRL-TR-75-50(1) 1975, for discussion of the objective and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc.

PREFACE

This report was prepared by the Biodynamic Environment Branch, Aerospace Medical Research Laboratory, under Project/Task 723108, Crew Safety In Operational Noise Environments.

The author acknowledges the efforts of Mr. John N. Cole who established the data analysis requirements, Mr. Henry Mohlman and Mr. Fred Lampley of the University of Dayton who assisted in the mechanics of data processing and Mrs. Peggy Massie who typed this report and prepared it for publication.

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INTRODUCTION

The USAF F-105D is a single seat all-weather fighter-bomber manufactured by the Fairchild Republic Division. Power is provided by one J75-P-19W turbojet engine manufactured by the United Aircraft Corporation, Pratt & Whitney Aircraft Division.

This volume provides measured data defining the bioacoustic environments produced inside the aircraft. Such data are essential to evaluate ear protection requirements, limiting personnel exposure times, voice communication capabilities, and annoyance problems associated with operations of the F-105D aircraft.

This volume is one of a series published by the Aerospace Medical Research Laboratory (AMRL) under the same report number (AMRL-TR-75-50) as a multi-volume handbook that quantifies the noise environments produced at flight/ground crew locations and in surrounding communities by operations of Air Force aircraft and ground support equipment. The far-field, community-type noise data in the handbook describe the noise produced during *ground operations* of aircraft ground support equipment, and other ground-based equipment or facilities.

Volume 1 of this handbook discusses the objectives and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc. Refer to Volume 1 (reference 1) for such information because it is not repeated in other handbook volumes.

A cumulative index lists those aerospace systems contained in the handbook, and identifies the specific volumes containing each type of environmental noise data available (i.e., in-flight/flight crew and passenger noise, near-field/ground crew noise, far-field/community noise). Volume numbers are assigned sequentially as individual volumes are published. This index is periodically updated as individual volumes are published, and is available upon request from AMRL/BBE, Wright-Patterson AFB, OH 45433. Organizations on the distribution list for the handbook will automatically receive a copy of the updated index as it is generated.

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1. Cole, John N., *USAF Bioenvironmental Noise Data Handbook, Volume 1: Organization, Content and Application*, AMRL-TR-75-50 (1), Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, Ohio, 1975.

IN-FLIGHT NOISE

MEASUREMENTS

All noise measurements were made on-board a F-105D aircraft during typical speed, altitude, and flight maneuver conditions. These levels describe the standard F-105D environments but may not be representative of those levels encountered if the aircraft has been configured differently (e.g., major equipment or structural changes).

Acoustic measurements were made inside the cockpit at the pilot's location. Table 1 lists the measurement location and test conditions as numeric/alphabetic designators which are used on the data pages. The designator 1/A means measurement location 1 and test condition A, etc.

The microphone was attached to the pilot's helmet by means of a lightweight boom. This arrangement enabled adjustment of the microphone close to the ear level at a distance of 0.1meter with its diaphragm parallel and facing away from the helmet's surface. In the analysis, microphone corrections for random incidence were applied to the overall system response. The recorded samples were analyzed using a four or eight second integration time to obtain a power-averaged level which effectively smooths out short duration fluctuations and best describes the exposure.

RESULTS

The measured data presented in Table 2 define the sound pressure levels (SPL) produced inside the F-105D aircraft at the specified location. This table includes the overall, 1/3 octave band, and octave band levels. From these data, C-weighted and A-weighted sound levels, maximum permissible time for one exposure per day (AFR 161-35) with and without standard Air Force ear protectors, preferred speech interference level, and perceived noise level are calculated and presented in Table 3. These measures are widely used to assess the effects of noise on personnel and their performance.

TABLE 1
MEASUREMENT LOCATIONS AND TEST CONDITIONS
F-105D Carswell AFB, 8 June 1978

<i>Location</i>	<i>Position</i>	<i>Height Above Deck</i>
1	Pilot	Seated Head Level
<i>Condition</i>	<i>Description</i>	
A	Ground Run Up — Engine Idle — Canopy Closed — ECS Off	
B	Ground Run Up — Engine Idle — Canopy Closed — ECS On	
C	Ground Run Up — Engine 100% RPM — Canopy Closed — ECS Off	
D	Ground Run Up — Engine 100% RPM — Canopy Closed — ECS On	
E	Taxi — Engine Idle — Canopy Closed — ECS On	
F	Taxi — Engine Idle — Canopy Open	
G	Takeoff — Engine A/B	
H	Climb To 2500' AGL — Engine A/B Off	
I	Low Altitude High Speed Run — 2000' AGL — 450 KIAS .63 M	
J	Descend 9000' ↘ 3000' PA — Engine Power Mil. — 450 KIAS	
K	Descend 11000' ↘ 3000' PA — Engine Power 88% 450 KIAS	
L	Simulated Dive Bomb Run 9500' — 7500' PA Engine 101% RPM — 450 KIAS	
M	Strafing — Gun Bursts — 8000' ↘ 4500' PA 450 KIAS .58 M	
N	Cruise — 11000' PA — 350 KIAS .63 M Engine 93% RPM	
O	Descend 11000' ↘ 9000' PA — 350 KIAS Engine 91% RPM — ECS Cycled To Remove Ice	
P	Descend 8000' ↘ 3000' PA — 350 KIAS — Engine 90% To Mil.	
Q	GCA Final Approach — 1500' PA — 170 KIAS — Gear And Flaps Down	
R	Touchdown — Landing Roll	
S	Taxi — Engine Idle — Canopy Open	

TABLE: MEASURED SOUND PRESSURE LEVEL (dB)

2

1/3 OCTAVE BAND

IDENTIFICATION:

OMEGA 302
TEST AC-079-101

RUN 01
31 MAY 79

PAGE F1

NOISE SOURCE/SUBJECT: OPERATION:

F-105D AIRCRAFT
IN-FLIGHT CREW NOISE

FREQ (Hz)	LOCATION/CONDITION									
	1/A	1/B	1/C	1/D	1/E	1/F	1/G	1/H	1/I	1/J
25	89	75	85	82	75	94	85	76	77	77
31.5	83	80	80	79	74	93	86	75	75	77
40	72	71	79	79	71	93	87	75	75	75
50	77	77	80	81	78	97	88	81	81	80
63	78	77	85	85	83	93	91	84	83	86
80	87	83	94	92	87	93	95	90	90	92
100	87	86	93	94	85	93	96	89	88	93
125	85	85	94	96	85	94	100	92	92	92
160	90	90	99	99	90	93	100	96	93	95
200	95	95	98	99	93	95	98	95	96	95
250	87	87	94	96	87	96	98	95	95	93
315	89	88	94	95	88	97	95	95	96	95
400	93	92	97	97	91	96	96	98	98	96
500	92	93	101	102	94	97	99	101	99	99
630	93	93	102	103	94	97	98	99	102	100
800	92	92	97	98	92	100	97	97	100	96
1000	94	94	97	101	95	104	98	98	102	101
1250	96	96	99	102	97	108	99	98	102	101
1600	98	99	99	99	92	108	98	99	100	99
2000	91	91	95	95	88	106	97	97	96	97
2500	89	89	90	95	87	103	95	96	94	95
3150	89	89	90	97	88	105	97	98	96	98
4000	93	93	91	97	88	110	97	99	96	98
5000	88	88	89	95	85	107	95	97	93	96
6300	89	89	95	97	91	109	98	101	96	100
8000	85	87	88	93	93	105	93	97	93	96
10000	83	84	84	90	86	101	93	96	94	94
OVERALL	105	105	110	111	104	117	111	110	111	111

LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (dB)
2 1/3 OCTAVE BAND

NOISE SOURCE/SUBJECT:		OPERATION:		LOCATION/CONDITION						1/S		
		1/L	1/M	1/N	1/O	1/P	1/Q	1/R	1/S	1/T	1/U	1/V
F-105D AIRCRAFT		77	79	75	76	76	76	76	82	84	91	91
IN-FLIGHT CREW NOISE		75	76	78	73	73	81	81	83	83	77	77
		76	76	79	74	74	84	82	82	83	71	71
		80	85	85	78	78	79	91	89	89	76	76
		84	85	88	81	84	82	92	90	81		
		90	89	94	87	89	86	94	91	90		
		94	95	94	93	94	88	92	90	89		
		91	91	93	91	92	91	94	93	86		
		94	94	94	91	92	91	96	93	91		
		95	95	96	94	95	95	96	97	96		
		92	92	96	90	92	94	95	95	92		
		95	94	94	92	94	94	96	92	89		
		95	96	94	94	95	97	97	95	93		
		97	98	96	96	97	99	99	99	99		
		98	99	98	95	97	99	100	99	98		
		96	96	97	95	96	98	95	95	95		
		100	100	98	98	99	99	96	95	96		
		99	101	99	97	98	98	96	96	96		
		100	99	99	99	99	99	98	98	98		
		98	96	96	98	97	93	93	93	93		
		96	95	94	98	96	92	92	92	91		
		99	98	96	100	98	94	95	92	92		
		100	98	98	101	99	94	94	91	89		
		98	96	95	98	98	92	92	88	85		
		101	99	99	101	101	97	97	90	86		
		98	95	95	98	98	94	92	89	85		
		96	94	94	96	96	94	89	86	82		
OVERALL		111	110	110	110	110	110	110	108	108	106	106

LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

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TABLE: MEASURED SOUND PRESSURE LEVEL (DB)
2 OCTAVE BAND

NOISE SOURCE/SUBJECT:	OPERATION:	LOCATION/CONDITION									
		1/A	1/3	1/C	1/D	1/E	1/F	1/G	1/H	1/I	1/J
F-105 AIRCRAFT		84	81	87	85	78	98	91	80	81	81
IN-FLIGHT CREW NOISE		88	85	95	93	89	99	97	91	91	93
		92	92	101	101	92	98	104	98	96	98
		96	96	104	102	95	101	102	99	100	99
		97	97	105	106	98	101	103	103	105	103
		99	99	102	105	99	110	103	102	106	105
		99	100	100	101	94	111	104	102	102	102
		95	95	95	101	92	112	104	103	101	102
		91	92	96	99	95	111	100	103	99	102
OVERALL		105	105	116	111	104	117	111	110	111	111

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TABLE: MEASURED SOUND PRESSURE LEVEL (DB)
2 OCTAVE BAND

NOISE SOURCE/SUBJECT: OPERATION:

F-105D AIRCRAFT
IN-FLIGHT CREW NOISE

FREQ (HZ)	LOCATION/CONDITION					
	1/K	1/L	1/M	1/N	1/P	1/Q
31.5	81	81	83	79	79	86
63	91	90	95	88	90	88
125	98	98	98	96	98	97
250	99	99	99	97	98	99
500	102	102	102	100	101	101
1000	103	104	104	102	103	102
2000	103	102	101	103	103	101
4000	104	102	101	104	103	100
8000	104	101	101	104	103	97
OVERALL	111	110	111	110	111	109

31 MAY 79

PAGE J2

) IDENTIFICATION:
) OMEGA 3.2
) TEST AC-079-001
) RUN 02
) 31 MAY 79
) PAGE J2

TABLE: MEASURES OF HUMAN NOISE EXPOSURE

3

NOISE SOURCE/SUBJECT		OPERATION		LOCATION/CONDITION		1/A		1/B		1/C		1/D		1/E		1/F		1/G		1/H		1/I		1/J																						
HAZARD/PROTECTION																																														
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR																																														
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR																																														
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)																																														
NO PROTECTION																																														
OASLC	T	OASLC	T	HGU-2A/P HELMET WITH H-154	T	OASLA*	T	HGU-2A/P HELMET WITH H-154 (A)	T	OASLA*	T	HGU-2A/P HELMET WITH CUSTOM LINER	T	OASLA*	T	COMMUNICATION	PSIL	ANNOYANCE																												
105	105	105	107	110	110	95	90	202	71	85	404	98	98	98	42	PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)	99	PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)	PNLT	TONE CORRECTION (C IN DB)	C	BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.	P ADDITIONAL EAR PROTECTION REQUIRED.																							
104	103	103	103	103	103	96	92	71	60	91	143	102	102	102	42	104	104	104	119	119	121	123	117	133	123	124	122	124	124																	
117	118	118	119	118	119	101	101	60	25	93	101	101	101	101	5	107	107	107	119	119	121	123	117	133	123	124	122	124	124																	
110	110	110	110	110	110	96	96	60	60	91	143	102	102	102	5	102	102	102	119	119	121	123	117	133	123	124	122	124	124																	
111	111	111	111	111	111	96	96	60	60	90	143	101	101	101	5	101	101	101	119	119	121	123	117	133	123	124	122	124	124																	
110	110	110	110	110	110	95	95	60	60	90	143	101	101	101	5	100	100	100	119	119	121	123	117	133	123	124	122	124	124																	
111	111	111	111	111	111	95	95	60	60	90	143	101	101	101	5	100	100	100	119	119	121	123	117	133	123	124	122	124	124																	
110	110	110	110	110	110	95	95	60	60	90	143	101	101	101	5	100	100	100	119	119	121	123	117	133	123	124	122	124	124																	
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110	110	110	110	110	110	95	95	60	60	90	143	101	101	101	5	100	100	100	119	119	121	123	117	133	123	124	122	124	124																	
111	111	111	111	111	111	95	95	60	60	90	143	101	101	101	5	100	100	100	119	119	121	123	117	133	123	124	122	124	124																	
110	110	110	110	110	110	95	95	60	60	90	143	101	101	101	5	100	100	100	119	119	121	123	117	133	123	124	122	124	124																	
111	111	111	111	111	111	95	95	60	60	90	143	101	101	101	5	100	100	100	119	119	121	123	117	133	123	124	122	124	124																	
110	110	110	110	110	110	95	95	60	60	90	143	101	101	101	5	100	100	100	119	119	121	123	117	133	123	124	122	124	124																	
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110	110	110	110	110	110	95	95	60	60	90	143	101	101	101	5	100	100	100	119	119	121	123	117	133	123	124	122	124	124																	
111	111	111	111	111	111	95	95	60	60	90	143	101	101	101	5	100	100	100	119	119	121	123	117	133	123	124	122	124	124																	
110	110	110	110	110	110	95	95	60	60	90	143	101	101	101	5	100	100	100	119	119	121	123	117	133	123	124	122	124	124																	
111	111	111	111	111	111	95	95	60	60	90	143	101	101	101	5	100	100	100	119	119	121	123	117	133	123	124	122	124	124																	
110	110	110	110	110	110	95	95	60	60	90	143	101	101	101	5	100	100	100	119	119	121	123	117	133	123	124	122	124	124																	
111	111	111	111	111	111	95	95	60	60	90	143	101	101	101	5	100	100	100	119	119	121	123	117	133	123	124	122	124	124																	
110	110	110	110	110	110	95	95	60	60	90	143	101	101	101	5	100	100	100	119	119	121	123	117	133	123	124	122	124	124																	
111	111	111	111	111	111	95	95	60	60	90	143	101	101	101	5	100	100	100	119	119	121	123	117	133	123	124	122	124	124																	
110	110	110	110</td																																											

TABLE I MEASURES OF HUMAN NOISE EXPOSURE

3

NOISE SOURCE/SUBJECT		OPERATION:		IDENTIFICATION:	
F-105D AIRCRAFT		TEST AC-079-001		OMEGA 3 ^o 2	
IN-FLIGHT CREW NOISE		PUN 02		31 MAY 79	
		PAGE H2			
		LOCATION/CONDITION			
1/K	1/L	1/M	1/N	1/O	1/P
				1/Q	1/R
					1/S
HAZARD/PROTECTION					
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR					
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DBA) AT EAR					
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)					
NO PROTECTION					
OASLC	11 ^r	110	109	109	109
OASLA	T	109	109	109	109
HGU-2A/P HELMET WITH H-154	5	6	5	6	8
OASLA*	T	95	95	95	94
HGU-2A/P HELMET WITH H-154(A)	71	71	71	71	71
OASLA*	T	89	90	87	88
HGU-2A/P HELMET WITH CUSTOM LINER	202	202	173	285	242
OASLA*	T	102	102	100	102
	21	21	30	25	21
					25
					30
COMMUNICATION PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)					
PSIL	103	103	102	101	102
					101
					100
ANNOYANCE PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)					
TONE CORRECTION (C IN DB)	PNL _T	123	123	124	124
C		1	1	1	1
					1
					1

* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.